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**Interrelated Measures for Control of Dissolved Oxygen, Salinity, Water Circulation and  
Water Depth in the San Joaquin River and South Delta**

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Introduction

The Central Valley Regional Water Quality Control Board held a workshop on April 23 regarding measures to eliminate violations of the dissolved oxygen, DO, standard in the Stockton Ship channel. The South Delta Water Agency, SDWA, submitted a letter proposing a flow related solution to this problem. That letter discussed the interrelation of that proposal with solutions to problems of salinity in the San Joaquin River and in South Delta channels, water levels and water depth throughout those channels, control of ammonia in urban wastewater, protection of fishery from other impacts, etc. The letter and the brief opportunity for discussion with the Board were insufficient to explain adequately these interrelated problems and potential compatible solutions.

Control of DO in the Ship Channel

The letter to the board and the brief oral discussion which the Board allowed, explained that if there was a minimum inflow of 1500 cfs to the Ship Channel (and somewhat less in winter months) the record shows that there would be no DO problem. We attempted to explain why this minimum inflow will largely occur incidental to solving other problems, and why the solutions to those problems will also make it possible to augment the inflow to meet the minimum inflow requirement when the incidental increase in flow is insufficient. We also explained that this can and should be achieved by redirecting and recirculating flow without any changes in water rights, or increased releases from tributaries.

Augmenting flow by keeping water out of Old River

The South Delta Improvement Program, SDIP, will issue an EIR/EIS this year which is expected to include the following measures which will increase flows into the Ship Channel.

When San Joaquin River flow is low most of it does not now reach the Ship Channel because it flows into Old River except when the temporary barrier at the head of Old River is in place from April 15 to May 15 and in the fall. Even then some flow into Old River is required to protect downstream channels. This inflow to Old River will be reduced for several reasons.

- 1) The water level at the head of Old River must be kept high enough during low river flows so that water depth between Vernalis and Old River is adequate for local diversion facilities in that river reach to function. This will be accomplished by using a weir or equivalent to maintain water level at that location. This will result in routing most of the Vernalis flow to the Ship Channel during low flows.
- 2) Water delivered to wetlands and farm lands in the CVP's westside service area via the Delta Mendota Canal, DMC, contains a very large load of salt. The wetland plants and crop plants in the service area that are within the San Joaquin watershed concentrate the salt and then typically drain several hundred thousand tons of salt into the river. This imported salt load now comes down the river and then flows through Old River and Grantline Canal to the CVP pumps where it is reexported. A function of the permanent operable barriers will be to largely stop this recycling of imported salt by keeping it out of Old River. This will reduce salinity in the DMC, and in the river, and in the South Delta channels. This is another reason why an increase in inflow to the Ship Channel will result from barrier operation.
- 3) When Vernalis flows are low and are not lower in salinity than the Vernalis salinity standard the equivalent internal South Delta salinity standards can not be met with river water. This is because the concentration of the Vernalis salt load increases as it goes downstream due to crop water use, and because the salt load is increased by urban drainage that enters the system. The lower the Vernalis flow, the more the increase in salinity. The barriers will, therefore, be operated at these times to tidally pump export quality water upstream through Middle and Old River and down through a weir in Grantline in sufficient quantity to meet local diversion requirements. This will also maintain circulation and water quality in those channels. A net daily unidirectional flow is needed in each channel in order to control salinity and dissolved oxygen in those channels. When the water that can be tidally pumped is insufficient, low-lift fish-friendly pumps, such as used elsewhere, will augment tidal flows. This barrier operation will largely eliminate the need to deplete Ship Channel inflow by letting some water into Old River for local needs.

4) The above measures will not meet the water quality standard in the river between the head of Old River and Stockton unless the salinity at Vernalis is lower than the Vernalis standard. With the barriers in place, however, it will be possible to use low-lift, fish-friendly pumps to move export-quality water upstream through the head of Old River and thence to the Ship Channel. This can meet the salinity standard in this reach of river, and also insure an adequate minimum inflow to the Ship Channel when the Vernalis flow is otherwise inadequate.

Proposals other than the SDIP which can increase inflow to the Ship Channel

Proposals other than SDIP can also be expected to increase inflow to the Ship Channel. When the permanent barriers are in place and properly operated no other new facilities are required. In the "Napa" and "UOP" negotiations, in discussions with DWR, and in discussions regarding a largely concentration based approach to controlling San Joaquin River salinity, it is anticipated that an essential component of resolving the above interrelated problems will be recirculation of DMC water. The exporters have indicated that in most summer months (July through September) there will be pump and conveyance capacity available to pump extra water down the DMC for release to the river through the Newman Wasteway and thence back down the river to the Delta. This would increase Vernalis flows, provide dilution for the river salt load, relieve the burden on the overcommitted New Melones Reservoir for flow and dilution releases, and increase flow to the Ship Channel. This recirculation of water can also be considered at other times when not precluded by sensitive fishery conditions. Recirculation may even be possible at fish sensitive times if the time of pumping can be staggered by pre or post pumping of water to San Luis Dam or by water exchanges. Recent modeling of flows and particle movement in Delta channels may further define times when minor fishery impacts are offset by the fishery benefit of DO control. Concerns about the effect of recirculation on encoding migrating salmon overlook the fact that Delta water already reaches the river by drainage from water delivered via the DMC to wetlands, to agricultural lands, and to exchange Contractors.

Conclusions

- a) An adequate inflow to the Ship Channel can eliminate the DO problem with greater assurance and less delay than other solutions.
- b) An adequate inflow will occur most of the time incidental to measures that are expected to be implemented as soon or sooner and with more assured effect than other means of controlling DO.
- c) The installation of permanent barriers within two to four years is required by the CALFED ROD, by the SDIP, by the need to meet interior South Delta salinity standards, by negotiations among exporters and Delta interests, and by legal commitments. No other new facilities are required to provide a minimum inflow to the Ship Channel except

the provision of fish-friendly low-lift pumps for use when the incidental flows cited above are less than 1500 cfs.

We believe that the Regional Board should concentrate on this flow approach to solving the DO problem. This would reduce the need for further lengthy studies of other more problematical solutions.

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cc John Herrick

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